CLAIMS

I/We claim:

[c1] 1. An apparatus for carrying an unmanned aircraft, comprising:

a support member;

a launch carriage movably carried by the support member; and

a gripper movably coupled to the launch carriage, the gripper including at least one grip portion positioned to releasably engage an unmanned aircraft, the gripper being movable relative to the launch carriage between a first position with the at least one grip portion positioned to contact the aircraft and a second position with the at least one grip portion positioned to be out of contact with the aircraft.

[c2] 2. The apparatus of claim 1 wherein the gripper includes at least one grip portion positioned to releasably engage a fuselage of the aircraft, the gripper being movable relative to the launch carriage between a first position with the at least one grip portion positioned to contact the fuselage and a second position with the at least one grip portion positioned to be out of contact with the fuselage.

[c3] 3. The apparatus of claim 1 wherein the gripper includes at least one gripper arm pivotally coupled to the launch carriage, the at least one gripper arm carrying the at least one grip portion positioned to releasably engage the fuselage of the aircraft.

[c4] 4. The apparatus of claim 1 wherein the gripper includes two gripper arms pivotally coupled to the launch carriage, the individual gripper arms including at least one grip portion positioned to releasably engage the fuselage of the aircraft.

[c5] 5. The apparatus of claim 1 wherein:

the gripper includes two gripper arms pivotally coupled to the launch carriage; and

the individual gripper arms include a first grip portion and a second grip portion positioned to releasably engage the fuselage of the aircraft, the first grip portion contacting the fuselage of the aircraft at a position forward of a lifting surface of the aircraft and the second grip portion contacting the fuselage at a position aft of the lifting surface of the aircraft.

[c6] 6. The apparatus of claim 1 wherein the gripper is movable between the first and second position when the launch carriage decelerates relative to the support member.

[c7] 7. The apparatus of claim 1 wherein:

the launch carriage is movable relative to the support member along a launch axis; and

the gripper is pivotable relative to the launch carriage about a pivot axis offset from the launch axis to pivot downwardly and outwardly away from the launch axis as the gripper moves from the first position to the second position, and wherein at least a portion of the mass of the gripper is eccentrically offset from the pivot axis to swing the gripper from the first position to the second position as the carriage decelerates.

[c8] 8. The apparatus of claim 1, further comprising the aircraft.

[c9] 9. The apparatus of claim 1 wherein the support member includes a launch guide structure having a launch axis, and wherein the launch carriage is movable relative to the support member along the launch axis.

[c10] 10. The apparatus of claim 1 wherein the support member includes an extendable boom having a longitudinal axis and a launch guide structure having a launch axis, the launch guide structure being carried by the extendable boom and the launch axis extending at least approximately parallel to the longitudinal axis of the boom.

[c11] 11. An apparatus for carrying an unmanned aircraft, comprising:

a launch guide structure having a launch axis;

a launch carriage carried by the launch guide structure and movable along the launch axis; and

a gripper supported by the launch carriage, the gripper including at least two gripper arms pivotally coupled to the launch carriage, the individual gripper arms including at least one grip portion positioned to releasably engage a fuselage of an unmanned aircraft, the at least two gripper arms being pivotally movable relative to the launch carriage between a first position with the at least one grip portion of the individual gripper arms positioned to contact the fuselage and a second position with the at least one grip portion of the individual gripper arms positioned to be out of contact with the fuselage.

[c12] 12. The apparatus of claim 11 wherein the launch guide structure includes a rail positioned along the launch axis, and wherein the launch carriage is movably carried by the rail.

[c13] 13. The apparatus of claim 11, further comprising an extendable boom having a longitudinal axis, wherein the launch guide structure is carried by the extendable boom and wherein the launch axis extends at least approximately parallel to the longitudinal axis of the boom.

[c14] 14. The apparatus of claim 11 wherein the individual gripper arms include a first grip portion and a second grip portion positioned to releasably engage the fuselage of the aircraft, the first grip portion of the individual gripper arms contacting the fuselage of the aircraft at a position forward of a lifting surface of the aircraft, and the second grip portion of the individual gripper arms contacting the fuselage at a position aft of the lifting surface of the aircraft.

[c15] 15. The apparatus of claim 11 wherein the at least two gripper arms are movable between the first and second position when the launch carriage decelerates relative to the launch guide structure.

[c16] 16. The apparatus of claim 11 wherein the gripper is pivotable relative to the launch carriage about a pivot axis offset from the launch axis to pivot downwardly and outwardly away from the launch axis as the gripper moves from the first position to the second position, and wherein at least a portion of the mass of the gripper is eccentrically offset from the pivot axis to swing the gripper from the first position to the second position as the carriage decelerates, further wherein the gripper is over-centered when in the first position to resist moving to the second position.

[c17] 17. The apparatus of claim 11 wherein the apparatus is configured to operate with an aircraft having a maximum thrust capability, and wherein the force required to move the gripper from the first position to the second position is greater than the maximum thrust capability of the aircraft but less than the momentum force applied to the gripper as the carriage decelerates.

[c18] 18. The apparatus of claim 11, further comprising the aircraft.

[c19] 19. An apparatus for carrying an unmanned aircraft, comprising:

carriage means for carrying an unmanned aircraft during launch;

support means for supporting and guiding the carriage means along a launch axis during takeoff; and

gripper means for releasably carrying an unmanned aircraft, the gripper means being movably coupled to the carriage means, the gripper means including at least one grip portion movable relative to the carriage means between a first position with the at least one grip portion positioned to contact the aircraft and a second position with the at least one grip portion positioned to be out of contact with the aircraft.

[c20] 20. The apparatus of claim 19 wherein the support means includes:

an extendable boom having a longitudinal axis; and

a launch guide structure carried by the extendable boom, the launch guide structure extending along the launch axis at least generally parallel to the longitudinal axis of the extendable boom.

[c21] 21. The apparatus of claim 19 wherein the gripper means includes a gripper having at least one gripper arm pivotally coupled to the launch carriage, the at least one gripper arm carrying the at least one grip portion positioned to releasably engage the fuselage of the aircraft.

[c22] 22. The apparatus of claim 19 wherein the gripper means is pivotable relative to the carriage means about a pivot axis offset from the launch axis to pivot downwardly and outwardly away from the launch axis as the gripper means moves from the first position to the second position, and wherein at least a portion of the mass of the gripper means is eccentrically offset from the pivot axis to swing the gripper means from the first position to the second position as the carriage means decelerates.

[c23] 23. A method for launching an unmanned aircraft, comprising:

releasably supporting an unmanned aircraft with a launch carriage;

releasably engaging the aircraft with a gripper carried by the launch carriage;

accelerating the launch carriage along a launch axis;

disengaging the gripper from the aircraft by moving the gripper relative to the launch carriage from a first position to a second position; and

releasing the aircraft from the launch carriage for flight.

[c24] 24. The method of claim 23, further comprising decelerating the launch carriage to move the gripper from the first position to the second position.

[c25] 25. The method of claim 23 wherein releasably engaging the aircraft with the gripper includes releasably engaging a fuselage of the aircraft with the gripper.

[c26] 26. The method of claim 23 wherein the gripper includes at least one gripper arm pivotally coupled to the launch carriage, and wherein moving the gripper from a first position to a second position includes rotating the at least one gripper arm downwardly and outwardly away from a longitudinal axis of the aircraft.

[c27] 27. The method of claim 23 wherein the gripper includes at least one gripper arm pivotally coupled to the launch carriage, and wherein moving the gripper from a first position to a second position includes rotating the at least one gripper arm outwardly away from a fuselage of the aircraft and downwardly away from a lifting surface of the aircraft.

[c28] 28. A method for launching an unmanned aircraft, comprising:

releasably supporting a fuselage of an unmanned aircraft with a launch carriage;

releasably engaging the fuselage of the aircraft with a gripper carried by the launch carriage, the gripper having at least one grip portion positioned to contact the fuselage of the aircraft;

accelerating the launch carriage along the launch axis;

decelerating the launch carriage to move the gripper relative to the launch carriage from a first position to a second position, with at least one grip portion out of contact with the fuselage when the gripper is in the second position; and

releasing the aircraft from the launch carriage for flight.

[c29] 29. The method of claim 28 wherein the gripper includes at least two gripper arms pivotally coupled to the launch carriage, and wherein moving the gripper from a first position to a second position includes rotating the at least two gripper arms outwardly and downwardly away from a longitudinal axis of the aircraft.

[c30] 30. The method of claim 28 wherein the gripper includes a first grip portion and a second grip portion positioned to releasably engage the fuselage of the aircraft, and wherein releasably engaging the aircraft with the gripper includes contacting the fuselage at a position forward of a lifting surface of the aircraft with the first grip portion and contacting the fuselage at a position aft of the lifting surface with the second grip portion.

[c31] 31. The method of claim 28 wherein the gripper is pivotable relative to the launch carriage about a pivot axis offset from the launch axis and at least a portion of the mass of the gripper is eccentrically offset from the pivot axis, and wherein decelerating the launch carriage to move the gripper relative to the

launch carriage from a first position to a second position includes pivoting the gripper downwardly and outwardly away from the launch axis as the gripper moves from the first position to the second position.